Abstract Submitted
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Imaging 2-20 MeV solar neutrons in the inner heliosphere with the SONNE detector[1] J. RYAN, U. BRAVAR, P. BRUILLARD, University of New Hampshire, E. FLUECKIGER, University of Bern, A. MACKINNON, University of Glasgow, J. MACRI, University of New Hampshire, P. MALLIK, University of Glasgow, B. PIRARD, University of Bern, R. WOOLF, University of New Hampshire — The Solar NeutroN Experiment (SONNE), a neutron detector with imaging and energy measurement capabilities sensitive to neutrons in the 2-20 MeV energy range, is specifically conceived as a candidate instrument for the Solar Sentinels program. Different design concepts have been explored to optimize the detection capabilities for solar-flare neutrons in the inner heliosphere. The detection principle is based on multiple elastic neutron-proton scatterings in organic scintillators. By measuring the scattering coordinates and determining the energy of recoil protons and time of flight of scattered neutrons, the energy spectrum and incident direction of primary neutrons can be reconstructed. We present the results of calibrations and further simulations that demonstrate that the instrument meets the requirements for unprecedented sensitive measurements of low-energy solar neutrons. We confirm that the instrument has an energy resolution of $\sim$20% over a wide range of energies and that its angular resolution is of order 15 degrees allowing for heavy background suppression. Furthermore, the efficiency agrees with the Monte Carlo model allowing us to extrapolate to the full instrument that may be deployed on Solar Sentinels.

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